



# Hearing Conservation

REVISED MARCH 2018

# TABLE OF CONTENTS

<b><u>SECTION</u></b> .....	<b><u>PAGE</u></b>
<b>1.0 INTRODUCTION</b> .....	<b>3</b>
<b>2.0 APPLICABILITY</b> .....	<b>3</b>
<b>3.0 REGULATORY REQUIREMENTS AND REFERENCES SUMMARY</b> .....	<b>3</b>
<b>4.0 PHYSIOLOGY OF NOISE</b> .....	<b>4</b>
<b>5.0 LIMITS FOR EXPOSURE TO NOISE</b> .....	<b>4</b>
<b>5.1 EIGHT-HOUR, TIME-WEIGHTED AVERAGE EXPOSURE LIMITS</b> .....	<b>4</b>
<b>5.2 MAXIMUM NOISE EXPOSURE</b> .....	<b>4</b>
<b>5.3 MAXIMUM EXPOSURE TO UPPER SONIC AND ULTRASONIC NOISE</b> .....	<b>4</b>
<b>5.4 SPEECH INTERFERENCE AND ANNOYING NOISE</b> .....	<b>4</b>
<b>5.5 SPEECH INTERFERENCE</b> .....	<b>5</b>
<b>5.6 ANNOYING NOISE</b> .....	<b>5</b>
<b>6.0 MEASUREMENT OF NOISE</b> .....	<b>5</b>
<b>7.0 MEDICAL SURVEILLANCE</b> .....	<b>5</b>
<b>8.0 CONTROL OF NOISE EXPOSURE</b> .....	<b>6</b>
<b>9.0 ENGINEERING CONTROLS</b> .....	<b>7</b>
<b>10.0 ADMINISTRATIVE CONTROLS</b> .....	<b>7</b>
<b>11.0 HEARING PROTECTORS</b> .....	<b>7</b>
<b>12.0 RESPONSIBILITIES</b> .....	<b>8</b>
<b>12.1 DEPUTY DIRECTOR OF PUBLIC WORKS OPERATIONS OR DESIGNEE</b> .....	<b>8</b>
<b>12.1.1 The Deputy Director of Public Works Operations or designee</b> <b>responsibilities:</b> .....	<b>8</b>
<b>12.2 MANAGERS AND SUPERVISORS</b> .....	<b>9</b>
<b>12.2.1 Managers and supervisors responsibilities:</b> .....	<b>9</b>
<b>12.3 EMPLOYEES</b> .....	<b>9</b>
<b>12.3.1 Employees responsibilities:</b> .....	<b>9</b>
<b>13.0 TRAINING</b> .....	<b>9</b>
<b>14.0 SUPPORTING REFERENCES AND STANDARDS</b> .....	<b>10</b>

## **APPENDICES**

- A Noise Measured Area Inventory's
- B Permissible Exposure Level (PEL) report
- C Revision History Log

## **1.0 INTRODUCTION**

Many operations and pieces of equipment used at the Burlingame Corporation Yard produce noise. Exposure to excessive levels of noise can result in a permanent hearing loss, development of tinnitus (i.e., ringing of the ears), a possible increase in blood pressure, and stress-related problems. Noise may also cause annoyance, difficulty in communicating, and can make it difficult to work effectively and safely. The following Hearing Conservation Program has been instituted to protect employees from harmful noise levels. This program involves:

- Identification of exposed personnel (monitoring).
- Implementation of noise-reducing engineering and administrative controls.
- Use of hearing protectors (plugs, ear muffs).
- Audiometric testing (baseline and annual).
- Training (annual).

## **2.0 APPLICABILITY**

This program is applicable to all Burlingame Corporation Yard employees who may be exposed to excessive noise levels, as defined in Cal/OSHA regulations.

Monitoring has determined that employees in the following operations may be exposed to noise above the Cal/OSHA Permissible Exposure Limit:

- Heavy Equipment Operation
- Street repairs
- Auto / Equipment maintenance and repair
- Power tool operation
- Storm/Water/Sewer pump station operations
- Pipe cleaning and repair
- Facilities maintenance and repair
- Water system repair and operations
- Operation of any equipment listed in the Appendix A Noise Survey above 85 dBA

Note that other maintenance and repair operations may also exceed the permissible limit

## **3.0 REGULATORY REQUIREMENTS AND REFERENCES SUMMARY**

Title 8, California Code of Regulations, §5095-5100 (8 CCR 5095-5100), contains the legal requirements for a Hearing Conservation Program. The primary reference for Hearing Conservation Programs is the Threshold Limit Values (TLV) established by the American Conference of Governmental Industrial Hygienists (ACGIH).

#### **4.0 PHYSIOLOGY OF NOISE**

Noise is the perception of pressure waves in the air caused by a vibrating source. The ears transduce this mechanical energy to electrochemical impulses that are transmitted to the brain, resulting in the perception of sound.

#### **5.0 LIMITS FOR EXPOSURE TO NOISE**

##### **5.1 EIGHT-HOUR, TIME-WEIGHTED AVERAGE EXPOSURE LIMITS**

Cal/OSHA, in 8 CCR 5097, requires employers to administer a continuing and effective hearing conservation program whenever employee noise exposure equals or exceeds an 8-hour Time-Weighted Average (TWA) sound level of 85 decibels as measured on the A-weighted scale (slow response).

The Permissible Exposure Limit for noise is 90 dBA for an 8-hour TWA. If employee exposure to noise exceeds this level, then engineering and/or administrative controls must be implemented. If employee exposure continues to be over 90 dBA for an 8-hour TWA, then appropriate hearing protection must be used to reduce employee exposures to noise to a level of 90 dBA or less. See 8 CCR 5096 for details on exposure limits for noise.

##### **5.2 MAXIMUM NOISE EXPOSURE**

Exposure to noise above 115 dBA is not permitted unless adequate hearing protection is worn (see above). The maximum exposure limit for impulse noise is 140 dB (un-weighted or C-weighted).

##### **5.3 MAXIMUM EXPOSURE TO UPPER SONIC AND ULTRASONIC NOISE**

The ACGIH has established a standard for exposure to very high audible frequencies and frequencies above the range of human hearing. This standard covers noise from 10,000 to 50,000 Hz (or 10 to 50 kHz), which is measured at the mid-frequency of the third octave band. See the ACGIH documents if necessary.

##### **5.4 SPEECH INTERFERENCE AND ANNOYING NOISE**

In some cases noise does not exceed standards established to protect hearing, but does interfere with speech or can cause annoyance. For example, nuisance noise can prevent effective communication between two or more employees working together as well as irritate employees, thereby reducing productivity. Although there are no mandatory standards for nuisance noise in the occupational setting, the guidelines and recommendations available should be followed to protect employees from exposure to this type of noise.

## **5.5 SPEECH INTERFERENCE**

Most of the information conveyed through speech is in the mid-frequencies - from about 500 to 6,000 Hz. Thus, these are the frequencies that are used to determine how noise will interfere with speech. A background noise level of 50 dB or less is desirable in a typical conference room; noise levels above 70 dB can often present a problem in such settings.

## **5.6 ANNOYING NOISE**

Noise may be annoying because of its level, frequency, or aspects of its modulation. A noise may not be very loud, but its frequency may be high enough to cause headaches in susceptible individuals. Alternatively, noise may not be very loud but may start and stop suddenly. This can disturb concentration or frighten exposed personnel. Because there are no guidelines for annoying noise, each case must be examined independently to attempt to alleviate the irritation.

## **6.0 MEASUREMENT OF NOISE**

Supervisors responsible for employees who may be exposed to noise at or above 85 dBA over an 8-hour TWA must notify the Deputy Director of Public Works or designee. A safety consultant can perform noise measurements, which may be taken to identify areas or specific operations that produce excessive noise or to evaluate an employee's exposure to noise throughout an 8-hour day. The results of the measurements are used to determine which, if any, controls are appropriate to reduce employee exposure to noise.

The Deputy Director of Public Works or designee will notify supervisors in writing of employees who are confirmed to be exposed to excessive levels of noise, regardless of the use of hearing protectors. Notification will include a statement regarding the supervisor's responsibility to enroll the employee(s) in a medical surveillance program, implement feasible engineering controls, and/or provide hearing protectors.

## **7.0 MEDICAL SURVEILLANCE**

A medical surveillance program has been established. One part of this program requires all employees with exposures to noise at or above 85 dBA over an 8-hour TWA to have a baseline audiogram and a follow-up audiogram annually thereafter, if their exposure to noise continues at or above the action level. Annual audiograms are not routinely required for employees who are not exposed to noise exceeding the action level.

Supervisors are required to enroll employees exposed to noise at or above the action level in the Hearing Conservation Program administered by the Deputy Director of Public Works or designee. This program shall meet all the requirements of 8 CCR 5097-5100 and shall include:

- Annual education on the health effects of noise exposure;
- Instructions on how to fit and wear hearing protectors (see 8 CCR 5098, "Hearing Protectors");

- A baseline exam and annual follow-up audiometric testing (see 8 CCR 5097, “Hearing Conservation Program”); and
- Recordkeeping (see 8 CCR 5100, “Recordkeeping”).

The Deputy Director of Public Works or designee will schedule audiometric testing and advise employees to wear hearing protectors or avoid noisy environments for 14 hours before the test. If this test shows that an employee may have suffered a standard threshold shift, Burlingame Corporation Yard medical services provider may schedule a retest within 30 days and consider the results of this retest as the annual audiogram. Burlingame Corporation Yard medical services provider and the Deputy Director of Public Works or designee will determine if the shift is occupational or non-occupational and must notify the employee in writing within 21 days of the determination. If the shift is determined to be occupational, Burlingame Corporation Yard medical services provider will:

- Refer the employee to the Deputy Director of Public Works or designee for possible re-evaluation of his/her workplace.
- Fit and train the employee in the use of hearing protectors (plugs and/or earmuffs) if none are used, and notify the employee's supervisor that the employee must wear hearing protectors.
- Assess the employee's level of knowledge in the types and use of hearing protection to augment knowledge deficits; that is, if the employee is already using hearing protectors. If the employee needs hearing protectors with greater attenuation, a Burlingame Corporation Yard medical services provider will inform the employee's supervisor and the Deputy Director of Public Works or designee. Then it shall be the responsibility of the supervisor to provide appropriate hearing protectors.

Burlingame Corporation Yard medical services provider and the Deputy Director of Public Works or designee may also require the employee to undergo further clinical audiological evaluation or otological examination if it is determined that such evaluation or examination is necessary, or if the medical services provider suspects that a medical pathology of the ear is caused or aggravated by the wearing of hearing protectors.

## **8.0 CONTROL OF NOISE EXPOSURE**

The three ways to reduce employee noise exposure are through the use of:

- Engineering controls
- Administrative controls
- Hearing protectors.

Hearing protectors (e.g., ear plugs, canal caps, and ear muffs) should only be used as a last resort after engineering and administrative measures have been implemented and further protection is still needed, or during the design and fabrication of suitable enclosures, sound damping materials, and isolation. Whenever employees are subjected to noise exceeding the limits

established in 8 CCR 5096, or prior to an employee completing an audiometric test, or if an employee, or if an employee has experienced a standard threshold shift, the Deputy Director of Public Works or designee will assist in the design of feasible administrative and engineering controls and will re-evaluate the employee and his/her work area after implementation of the controls. If the controls fail to reduce the noise levels to below the limits established in 8 CCR 5096, then:

- The supervisor shall enroll the employee in the Hearing Conservation Program.
- The supervisor shall require the employee to wear appropriate hearing protection.

## **9.0 ENGINEERING CONTROLS**

The best way to limit noise exposure is to alter the noise-producing equipment or change the environment to reduce noise levels. Examples may include replacing old, noisy equipment; increasing sound dampening around noisy equipment; and improving muffler design. Engineering controls must be formally considered before other types of controls are implemented.

## **10.0 ADMINISTRATIVE CONTROLS**

Another way to limit noise exposure is to alter the work rules. For example, an employee scheduled to work on several pieces of noisy equipment should perform his/her tasks over several days so that the average exposure on each day does not exceed the permissible limit.

In addition, caution labels or signs should be posted in areas where it has been determined that noise levels may exceed 85 dBA. Similarly, a warning sign should be posted on equipment and in areas where it has been determined that noise levels (other than impact or impulse noise) may exceed 90 dBA. These signs should notify the worker of a potential noise hazard and specify the conditions under which hearing protectors are recommended or required. Caution labels and signs are particularly important where workers' duties require them to move among different locations or use a variety of tools. The purpose and meaning of the signs shall be included in the training aspect of the Hearing Conservation Program.

## **11.0 HEARING PROTECTORS**

Hearing protectors should be used as a last resort when after engineering and administrative measures have been implemented and further protection is still needed, or during the design and fabrication of suitable enclosures, sound dampening materials, and isolation. Thereafter, supervisors shall provide employees affected by noise with earplugs and/or earmuffs as needed.

Hearing protectors must provide adequate attenuation so employees are not exposed to excessive noise levels. Each hearing protector provided by the manufacturer has a "Noise Reduction Rating" (NRR) number, which is a general guide to the level of noise reduction (in decibels) the protector will provide if it is fitted and worn properly. The effective NRR is less than the labeled NRR (Effective NRR (dB) = Labeled NRR - 7). Title 8 CCR Section 5100, Appendix E, if necessary.



Supervisors may select hearing protectors for employees affected by noise at levels up to 95 dBA, but should contact the Deputy Director of Public Works or designee to select the appropriate type of hearing protector for areas where exposure above 95 dBA is possible. Generally, earmuffs are more likely to be worn correctly than are earplugs; thus, the actual noise reduction provided by earmuffs in the field is closer to the stated value.

## **12.0 RESPONSIBILITIES**

### **12.1 DEPUTY DIRECTOR OF PUBLIC WORKS OR DESIGNEE**

#### **12.1.1 The Deputy Director of Public Works or designee responsibilities:**

- Reviewing operations to determine if there is a potential for exposure to loud or annoying levels of noise.
- Evaluating employees' concerns regarding noise levels in the workplace.
- Initiating noise surveys to establish the noise levels at various work sites; and posting the appropriate signs in specific areas, operations, or equipment that may expose employees to noise above 85 dBA.
- Where feasible, initiate dosimetric noise surveys on employees who may be exposed to noise levels that meet or exceed the action level.
- Notifying supervisors in writing of those employees found to be exposed to noise levels that exceed the action level.
- Advising supervisors that these employees must participate in annual audiometric testing offered by Burlingame Corporation Yard medical services provider and annual training.
- Assisting with designing engineering controls to reduce employee exposure to noise.
- Providing specialized compliance training to employees who have been exposed to noise that exceeds the applicable standards.
- Selecting the most appropriate type of hearing protectors for employees exposed to noise at levels above 90 dBA.
- Establishing and maintaining an audiometric testing program in accordance with 8 CCR 5097.
- Providing employees with annual education on the health effects of noise exposure, instructions on how to fit and wear hearing protectors, and conducting a baseline examination and annual follow-up audiometric testing (key elements of Burlingame Corporation Yard Hearing Conservation Program).

- Providing earplugs or ear muffs to employees who are newly enrolled in the audiometric testing program.
- Re-evaluating the worksite of employees with apparent significant work-related Standard Threshold Shifts.

## **12.2 MANAGERS AND SUPERVISORS**

### **12.2.1 Managers and supervisors responsibilities:**

- Informing the Deputy Director of Public Works or designee of personnel who are potentially exposed to hazardous levels of noise.
- Ensuring that the noise level of equipment to be acquired is considered in the purchasing process.
- Enrolling employees found to be exposed to noise levels that exceed the action level in an Burlingame Corporation Yard's Hearing Conservation Program.
- Enforcing the use of hearing protectors where required.
- Ensuring that engineering controls (e.g., enclosure and sound dampening) are used on equipment that generates potentially hazardous noise levels.

## **12.3 EMPLOYEES**

### **12.3.1 Employees responsibilities:**

- Contact their supervisors and the Deputy Director of Public Works or designee if noise levels in the workplace are above speech level.
- Use hearing protectors where required and adhere to signs identifying noisy areas.
- Participate in required medical exams, required education, and demonstrations on how to properly fit protectors offered by Burlingame Corporation Yard.

## **13.0 TRAINING**

Employees who are exposed to noise exceeding the 8-hour time-weighted average (85 dBA) or the peak (140 dB) must have full compliance training. This training covers the following:

- The effects of noise on hearing.
- When and/or where hearing protectors are required.
- The purpose of hearing protectors.
- The advantages, disadvantages, and attenuation of various types of protectors.

- Instructions on how to select, use, fit, and care for hearing protectors.
- The purpose of audiometric testing, including an explanation of the test procedures.
- Follow-up annual retraining shall be coordinated by the Deputy Director of Public Works or designee following initial audiometric testing.

#### **14.0 SUPPORTING REFERENCES AND STANDARDS**

California Code of Regulations, Title 8, Subchapter 7, General Industry Safety Orders; Group 15, Occupational Noise; Article 105, Control of Noise Exposure (Sections 5095 – 5100)

American Conference of Governmental Industrial Hygienists, *Threshold Limit Values for Physical Agents in the Work Environment*, ACGIH, Cincinnati, OH.

## **APPENDIX A**

### **Noise Measured Area Inventory**

**[Appendix A 2018 Noise Measured Inventory.xlsx](#)**

## **APPENDIX B**

### **Permissible Exposure Limit (PEL) Report**

**[Noise%20Survey%20PEL%20Table%20Final.doc](#)**

